

Toward “Agile Beam Transceivers” for Planetary Exploration

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Abstract

Phased array antennas have been in use for many decades primarily because of their ability to provide beam agility at electronic speed. This is particularly useful in radar applications where multiple rapidly moving targets are encountered. In these applications the complexity and cost of such antennas are clearly warranted, as there appears to be no other way to achieve the required performance. On the other hand, in communications applications, these performance features have not been considered worth the expense.

More recently, several means of simplifying phased array architectures have been proposed with the goal of reducing the cost thus rendering applications in communications systems more reasonable. Among these is the concept of controlling aperture phase distribution by means of arrays of inter-injection locked voltage controlled oscillators. This represents a vast simplification of the beam steering function. JPL has been developing this concept during the past three years and has recently produced the first two-dimensional array based on this principle.

This presentation will describe the work leading to the above laboratory model array and will include a description of the operating principles, the physical design, and the performance of this and an earlier one-dimensional array. Interestingly, these “antennas” actually generate the rf signals and, as such, may be termed “agile beam transmitters.” In the same sense, future generations may be termed “agile beam transceivers.” It appears that these will find important application in the communications infrastructure for planetary exploration.

The Speaker

Dr. Ronald J. Pogorzelski (aka POGO), a Principal Engineer at JPL, is Supervisor of the Spacecraft Antenna Research Group in the Spacecraft Telecommunications Equipment Section. He has been with JPL for nearly seven years working on advanced antenna concepts for space, air, and ground vehicle applications. He is active in the Union Radio-Scientifique Internationale (URSI) for which he is the current Vice-Chair and Chair-elect of the U. S. Commission B (Fields and Waves). He is also a Fellow of the IEEE and an IEEE Third Millennium Medalist.